"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

86705
S/180/60/000/006/025/030
E111/E335

Interparticle Interaction in Liquid Alloys of Silicon with Iron and Nickel

The authors recommend further attention to the rough relations proposed by several authors for estimating heats of formation from volume decreases.
There are 2 figures and 14 references: 9 Soviet and 5 non-Soviet.

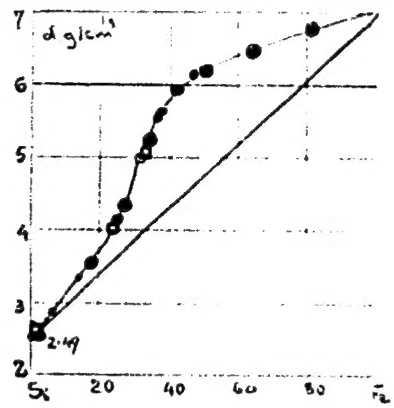

Fig. 1

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S/180/60/000/006/025/030
E111/E335

Interparticle Interaction in Liquid Alloys of Silicon with Iron and Nickel

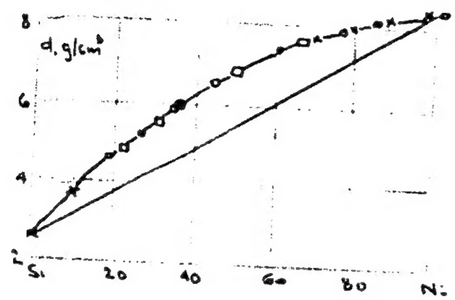

Fig. 2

SUBMITTED: August 26, 1960

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APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

S/180/60/000/006/027/030
E201/E391

AUTHORS: Gel'd, P.V. and Kocherov, P.V. (Sverdlovsk)

TITLE: Ordering of Liquid Alloys of Calcium and Aluminium

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1960, No. 6, pp. 142 - 145

TEXT: The authors report measurements of the temperature dependence of the enthalpy of two Ca-Al alloys containing 42.55 and 24.3% Ca by weight. The first was close in its composition to $CaAl_2$ (melting point at 1079 °C) and the second could be approximately represented by $CaAl_4$ (melting point at 700 °C). Enthalpies were measured using a high-temperature calorimeter described earlier (Ref. 3). Fig. 1 gives the temperature dependence of enthalpy for $CaAl_2$ (Fig. 1a) and $CaAl_4$ (Fig. 1b). The latent heat of fusion of $CaAl_2$ (11.8 - 13.5 kcal/g-mole) is considerably greater than

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E201/E391

Ordering of Liquid Alloys of Calcium and Aluminium

the sum of the heats of fusion of the alloy components. This indicates partial short-range disordering in $CaAl_2$ on melting. This disordering is confirmed by calculated values of specific heat of $CaAl_2$; the specific heat results indicate also changes in the nature of atomic interactions on melting. The results obtained for $CaAl_4$ were fully analogous to those for $CaAl_2$, i.e. again melting produced loss of short-range order and changes in atomic interactions. There are 1 figure and 4 Soviet references.

SUBMITTED: August 26, 1960

Card 2/2

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

GEL'D, P.V.; RYABOV, R.A.

Influence of compnents on the rate of hydrogen diffusion in steels at high temperatures. Trudy kom.anal.khim. 10:27-36 '60.
(MIRA 13:8)

1. Ural'skiy politekhnicheskik institut im. S.M.Kirova, Sverdlovsk.
(Steel--Hydrogen content)
(Diffusion)

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

RYABOV, R.A.; GEL'D, P.V.

Effect of phase transformations on the rate of diffusion of hydrogen in steels. Trudy kom.anal.khim. 10:37-45 '60. (MIRA 13:8)

1. Ural'skiy politekhnicheskiy institut im. S.M.Kirova, Sverdlovsk.
(Steel--Hydrogen content)
(Diffusion)

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

KRENTIS, R.P.; GEL'D, P.V.; SEREBRENNIKOV,N.N.

Enthalpy and the heat of fusion of steels. Carbon and low-alloy steels. Izv. vys. ucheb. zav.; chern. met. no. 11:5-11 '60. (MIRA 13:12)

1. Ural'skiy politekhnicheskiy institut.
(Steel--Thermal properties)

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

MATVEYENKO, I.I.; ~~GEL'D, P.V.;~~ ALYAMOVSKIY, S.I.

Kinetics of the reduction of vanadium pentoxide and tetroxide by carbon. Izv. Sib. otd. AN SSSR no. 11:77-88 '60. (MIRA 14:1)

1. Ural'skiy filial AN SSSR.
(Vanadium oxides) (Carbon)
(Reduction, Chemical)

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

23616

S/148/60/000/012/001/020
A161/A133

18.8100 1418, [redacted]

AUTHORS: Krentsis, R. P.; Gel'd, P. V., and Serebrennikov, N. N.

TITLE: The enthalpy of chromium and some chromium ferroalloys at high temperatures

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no. 12, 1960, 5 - 11

TEXT: Only few data are available on the enthalpies and heat capacities of many ferroalloys at high temperatures, though such data are absolutely necessary for engineering and thermodynamic calculations. The purpose of the subject investigation was to obtain the missing data. Two adiabatic mixing calorimeters of different type were used, a non-sealed for the range from room temperature to 1,000 - 1,200°C and a vacuum type for the high range up to the melting point; the measurement accuracy was 1.2% in the range above 1,300°C, and 0.8% below that, the vacuum unit had already been described by N. N. Serebrennikov, R. P. Krentsis and P. V. Gel'd (Ref. "Zavodskaya laboratoriya", 1960, no. 1, 109). The obtained values were reduced to 0° in experiments with an ice refrigerator. Test results are

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23616

S/148/60/000/012/001/020

The enthalpy of chromium and some chromium... A161/A133

presented in the included table. The following metals and alloys were studied: aluminothermic Cr of (%) 98.66 Cr; 0.20 Si; 0.43 Al; 0.64 Fe; 0.036 C and 0.007 P; non-carbon ferrochrome - 76.45 Cr; 0.35 Si; 0.14 Al; 0.26 C; 0.008 S; nitrated ferrochrome - 77.75 Cr; 0.52 Si; 0.20 Al; 1.20 N_2; 0.028 C and 0.014 S; an alloy - 63.91 Cr; 18.11 Al; 16.55 Fe; 0.67 Si; 0.024 C and 0.004 S. Empirical equations have been derived determing the enthalpy (ΔH_0^t) and heat capacity (c_p) with sufficient accuracy (1 - 1.5%) for a wide temperature range (from 273 to 1,873°K). The obtained enthalpy values matched the data of other authors up to 1,100°C, higher on the ΔH and c_p of Cr rose smoothly to 1,600°C without noticeable anomaly in the 1,300 - 1,400° range which might mean the absence of the $\alpha \rightleftarrows \beta$ transformation in the experiment conditions, or the mixing calorimeters not reflecting the low transformation heat that had been determined by H. A. Martin (Ref. 9: Z. Metallkunde, 49, 1958, 390), or the impurities suppressing the transformation. The heat capacity of Cr at high temperatures considerably exceeded the 5.956 cal/g-atom-degree prescribed by the Dulong-Petit law. It is assumed that the specific enthalpy of alloys should slightly increase with the addition of nitrogen. The temperature effect on the ΔH of both nitrated and

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non-carbon ferrochrome was nearly equal but slightly higher in nitrated ferrochrome, the difference not more than 1 - 2% even at a high temperature range. The enthalpy and heat capacity equations for non-carbon ferrochrome are:

$$\Delta H_{273,1}^{T^\circ K} = -18,48 + 0,0787T + 3,869\cdot 10^{-5} T^2 - 1608\cdot T^{-1}, \text{ cal/g} \qquad (3)$$

and

$$c_p = 0,0787 + 7,738\cdot 10^{-5} T + 1608\cdot T^{-2}, \text{ cal/g degree} \qquad (4)$$

and for nitrated ferrochrome:

$$\Delta H_{273,1}^{T^\circ K} = -21,91 + 0,08352\cdot T + 3,897\cdot 10^{-5}\cdot T^2 - 956,5\cdot T^{-1}, \text{ cal/g} \qquad (5)$$

and

$$c_p = 0,08352 + 7,794\cdot 10^{-5}\cdot T + 956,5\cdot T^{-2}, \text{ cal/g degree} \qquad (6)$$

The Cr-Al-Fe alloy was apparently dependably protected from oxygen by the forming spinel film in the non-sealed calorimeter. In the vacuum unit a slight quantity of argon was added. As may be seen (from the table and the

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polytherm, Fig. 5), its enthalpy rose abnormally fast in the 720 - 800°C range, which may be due to transformation with β-phase decomposition. The low-temperature branch of the curve for the Cr-Al-Fe alloy (i.e. 273 - 973°K) is described (with an accuracy up to 0.4%) with the interpolation polynome

$$H_{273.1}^{T°K} = -27.35 + 0.0982 \cdot T + 4.492 \cdot 10^{-5} \cdot T^2 - 794.5 \cdot T^{-1}, \text{ cal/g} \quad (7)$$

from where

$$c_p = 0{,}0982 + 8{,}984 \cdot 10^{-5} \cdot T^2 + 794{,}5 \cdot T^{-2}, \text{ cal/g·degr} \quad (8)$$

and for 1,073 - 1,523°K the curve is described linearly:

$$\Delta H_{273.1}^{T°K} = -64{,}6 + 0{,}203T, \text{ cal/g} \quad (9)$$

where the heat capacity of the alloy is constant and equals 0.203 cal/g·degr. As the equations (7) and (9) do not include the transition range 700 - 800°C, it is recommended to extend equation (7) to 1,063°K and introduce a fictitious isothermic transformation (instead of the polythermic at 1,063°K) in which the hatched areas (in Fig. 5) are equal. The transformation heat of-

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A161/A133

fect at 1,063°K will then amount to about 26.5 cal/g. From 1,250°K on the H, the curve rises abruptly due to melting that ends at 1,550°. The melting point can be roughly determined by extrapolating the H curve of the solid phase, which makes (with 7% accuracy) 130 cal/g. There are 5 figures and 20 references: 10 Soviet-bloc and 10 non-Soviet-bloc. Four most recent English-language publications read as follows: T. R. McGuire, C. J. Kriessmann. Phys. Rev., 85, 1952, 452; D. S. Bloom, N. J. Grant. J. Metals, 3 (11), 1951, 1009; C. Stein, N. J. Grant. J. Metals, 7 (1), 1955, 127; E. P. Abrahamson, N. J. Grant, J. Metals, 8 (8), 1956, 975.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute)

SUBMITTED: March 21, 1960

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

IGISHEV, V.N.; GEL'D, P.V.

Thermoelectric properties of alloys in the Fe - FeSi system. Trudy Ural.politekh.inst. no.96:182-189 '60. (MIRA 14:3)
(Iron-silicon alloys) (Thermoelectricity)

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

GOL'DBERG, A.I.; GEL'D, P.V.

Effect of impurities on the thermoelectric properties of a low-temperature leboite. Trudy Ural.politekh.inst. no.96:190-194 '60. (MIRA 14:3)

(Leboite) (Thermoelectricity)

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

SHUMILOV, M.A.; GEL'D, P.V.

Effect of impurities on the crumpling of iron-silicon alloys.
Trudy Ural. politekh. inst. no.105:129-135 '60. (MIRA 14:3)
(Iron-silicon alloys--Metallography)

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

KORSHUNOV, V.A.; GEL'D, P.V.

Electric properties of commercial manganese-silcon alloys.
Trudy Ural. politekh. inst. no.105:142-150 '60. (MIRA 14:3)

(Manganese-silicon alloys--Electric properties)

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

SHVEYKIN, G.P.; GEL'D, P.V.; LYUBIMOV, V.D.

Effect of the recrystallization of niobium pentoxide on the rate of its deoxidation. Izv. vys. ucheb. zav.; tsvet. met. 3 no.3:120-125 '60. (MIRA 14:3)

1. Ural'skiy politekhnicheskiy institut.
(Niobium oxide) (Crystallization)

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

86487

S/078/60/005/008/020/031/XX
B023/B066

5.1190 2209, 1208, 1274

AUTHORS: Gel'd, P. V., Alyamovskiy, S. I., Matvoyenko, I. I.

TITLE: Intermediates of V_2O_5 Reduction With Hydrogen

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol. 5, No. 8, pp. 1678-1687

TEXT: The authors deal with the question how the transformation process of V_2O_5 to V_2O_3 proceeds, which intermediate phases are formed therein, how large their quantity is, and in how far the conversion of some higher oxides to lower ones is complicated. In the first experimental series, the composition of the samples was investigated. Fragments of V_2O_5 briquettes (2-3 mm) were subjected to a partial reduction in hydrogen at 400-600°C. The second series was carried out with preparations of different degrees of reduction. In the third series, samples were investigated which had been prepared in layers and partially reduced with H_2. The X-ray structural analysis of the products of a partial reduction of V_2O_5 with hydrogen was

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Intermediates of V_2O_5 Reduction With Hydrogen S/078/60/005/008/020/031/XX B023/B066

made in РКД (RKD) or ВРС (VRS) cameras by means of chromium radiation. When investigating the intermediate products of the reduction of vanadium pentoxide by hydrogen, which had been obtained at 200-1200°C, the authors detected V_6O_{13}, V_2O_4, and V_2O_3, while $VO_{1.75}$, $VO_{1.80}$, $VO_{1.84}$, and $VO_{1.86}$ could not be found. Though phases of $VO_{1.67}$ and $VO_{1.87}$ were present, they could not be clearly identified, since they occur only in minute quantities. By the reduction of V_2O_5 with hydrogen, monophase oxide preparations as intermediates of V_2O_5 and V_2O_3 could not be obtained. The theorem of A. A. Baykov (Ref. 9) on the sequence of conversions applies to relatively slow interactions proceeding in systems of different composition and different structure. If the process occurs rapidly in systems containing phases of similar composition and structure, some of these phase components are possibly not formed. Table 2 shows the phase composition of products of a partial reduction of V_2O_5 by hydrogen. Table 3 illustrates the phase composition of products of vanadium pentoxide with hydrogen. Mention is made of papers by V. I. Arkharov, B. S. Borisov, T. V. Dolgal' (Ref. 32),

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86487

Intermediates of V_2O_5 Reduction With Hydrogen S/078/60/005/008/020/031/XX
B023/B066

G. A. Meyerson and A. N. Zelikman (Ref. 51), M. A. Gurevich and B.T. Ormont (Ref. 28). There are 1 figure, 4 tables, and 54 references: 25 Soviet, 10 US, 2 British, 7 Danish, 3 French, 5 German, 1 Japanese, 1 Swedish, and 1 Swiss.

SUBMITTED: March 5, 1959

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

GEL'D, P.V.

S/078/60/005/008/004/018
B004/B052 82324

5.2610

AUTHORS: Kocherov, P. V., Gel'd, P. V.

TITLE: Enthalpy and Dissociation Vapor Pressure of $CaAl_2$

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol. 5, No. 8, pp. 1774-1782

TEXT: On the basis of previous papers on $CaAl_2$ and $CaAl_4$ (Refs 1, 2), the authors investigated the influence of disordering of $CaAl_2$ on the physical data of this compound. Two alloys were produced for measuring the enthalpy. One (I) contained 43.7 weight% of Ca, thus corresponding to $CaAl_2$ with a content of 2% of free metallic Ca. The second one (II) contained 24.3 weight% of Ca, i.e., it consisted of a solid solution of 11% of Ca in 89% of $CaAl_4$. For measuring the vapor pressure, alloys of 28.90, 33.41, 39.48, 55.36, 48.93, and 46.56 weight% of Ca were produced. The temperature dependence of the enthalpy was measured in an adiabatic calorimeter of the Skuratov system, and has already been described in previous papers

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Enthalpy and Dissociation Vapor Pressure of $CaAl_2$

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82324

(Refs. 6, 7). Crucibles made of ЭИ 405 (EI405) or ЭИ 612 (EI612) steel and quartz were used for the alloys. Fig. 1 gives the specific enthalpies of the material used for the crucibles, as function of the temperature. Table 1 and Fig. 2 give the measured enthalpies of metallic Ca, Table 2, Figs. 3, 4 the values of alloys I and II. The dissociation pressure was measured according to Knudsen, and the data on the dissociation pressure of Ca over pure Ca and $CaAl_2$ alloys are given in Fig. 5. The authors arrived at the following conclusions: the enthalpy of solid $CaAl_2$ and $CaAl_4$ can be computed for a wide temperature range according to the law of Kopp and Neumann by using the thermal data of α Ca. The fusion of $CaAl_2$ and $CaAl_4$ involves a considerable disordering which has to be taken into consideration in the calculation of the heats of fusion. The enthalpy of $CaAl_2$ is considerably larger than that of $CaAl_4$ and the sum of the enthalpies of the two components. This is explained by the amount of energy consumed during the disordering of the melt. An abrupt and considerable reduction of the Ca vapor pressure over $CaAl_2$ takes place in the homogeneity range

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

Enthalpy and Dissociation Vapor Pressure of $CaAl_2$

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of solid $CaAl_2$. This proved to be due to the greater heat of formation of solid $CaAl_2$ from solid Ca and solid $CaAl_4$, i.e., the stronger bond between Ca and Al atoms in the congruently melting compound $CaAl_2$. There are 5 figures, 2 tables, and 12 references: 8 Soviet and 4 US.

X

SUBMITTED: May 22, 1959

Card 3/3

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

5.2100(A)

S/126/60/009/02/032/033
E111/E335

AUTHORS: Gel'd, P.V., Alyamovskiy, S.I. and Matveyenko, I.I.

TITLE: The Structural Characteristics of Vanadium Oxide

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 2, pp 315 - 317 (USSR)

ABSTRACT: Investigations were carried out on samples of varying composition ($VO_{0.75}$ to $VO_{1.74}$), prepared by vacuum sintering of briquettes of metallic vanadium and vanadium trioxide. The samples were heated at 1 400 °C for 60 to 76 hours. X-ray analysis was carried out and the results are given in the table. Samples $VO_{0.75}$ and $VO_{1.3}$ were two-phased. A relation between the lattice parameter and composition was observed only in the interval $VO_{0.85}$ to $VO_{1.25}$. Special interest is caused by the possible existence of a ζ phase. This would be expected to have an NaCl structure. From experimental and theoretical densities, it is shown that the concentration of vacancies in the region of homogeneous vanadium oxide

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E111/E335

The Structural Characteristics of Vanadium Oxide

was 12 to 22% in the vanadium sub-lattice. The concentration relation of the thermal emf shows a change of sign at the composition corresponding to stoichiometric VO, as would be expected.
There are 1 table and 3 references, 3 of which are Soviet and 1 English.

ASSOCIATION: Institut khimi UFAN SSSR (Institute of Chemistry, UFAN SSSR)
Ural'skiy politekhnicheskiy institut im. S.M. Kirova (Ural Polytechnical Institute imeni S.M. Kirov)

SUBMITTED: December 26, 1959

Card 2/2

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

S/126/60/009/03/031/033
E111/E452

AUTHORS: Gel'd, P.V. and Petrushevskiy, M.S.

TITLE: Solubility of Carbon in Alloys of Iron with Chromium and Silicon

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 3, pp 473-475 (USSR)

ABSTRACT: The authors report their investigation of the solubility of carbon at 1700°C in a series of iron-chromium-silicon and binary alloys covering the range: mole fraction of silicon, 0 to 0.50; ratio mole fraction of iron to that of chromium, 0 to 2.76; mole fraction of chromium, 0 to 0.40. Melts were kept in a graphite crucible in an oxygen-free argon atmosphere for one hour then quenched, crushed and analysed. Results are tabulated. The solubility of carbon decreases as the N_{Fe}/N_{Cr} ratio increases and especially as N_{Si} increases. The greatest value of N_C tabulated is 0.320 at $N_{Cr} = 0.40$, $N_{Si} = 0$. The authors briefly discuss the particle interaction energies, the accumulation of information on which for multi-component metallic solutions was one of the objects of this work.

Card 1/2

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E111/E452

Solubility of Carbon in Alloys of Iron with Chromium and Silicon

Another object was to use solubility data to estimate heats of mixing. There is 1 table.

ASSOCIATION: Ural'skiy politekhnicheskiy institut im S.M.Kirova (Ural Polytechnical Institute imeni S.M.Kirov)

SUBMITTED: November 9, 1959

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80884

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E111/E352

18.7500

AUTHORS: Sidoronko, F.A., Gel'd, P.V. and Shumilov, M.A.

TITLE: Investigation of the Transformations of Alpha-lebeauite

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 6, pp 861 - 867

ABSTRACT: The zeta phase (lebeauite) in the system iron-silicon (phase diagram in Figure 1) is of technological interest. The transformations of this phase have been studied by Gel'd and his co-workers (Refs 1, 8-11) and Abriksov (Ref 7); two modifications were established but the published data on the kinetics of the three reactions relate to alloys of technical purity. The present work describes the metallographic, dilatometric and X-ray analytical study of products of three possible reactions (see below) for high-purity alloys. Metallographic specimens were prepared from vacuum annealed carbonyl iron (grade R-4) and chemically purified silicon (99.95% Si and 0.03% Fe). Mixed powders were compressed into tablets and melted in a vacuum tungsten furnace, the cast specimens then being homogenized in vacuo at 1 080 °C for 100 hours. Dilatometric specimens were prepared from

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

80884

S/126/60/009/06/009/025
E111/E352

Investigation of the Transformations of Alpha-lebeauite

electrolytic iron and pieces of silicon single crystals; the melted alloy was sucked into 2-4 mm diameter quartz tubes, both untreated and homogenized specimens being tested by a procedure described previously (Ref 10). The microstructure was studied with a MIM-8 microscope and microhardness with a PMT-3 apparatus. Phase analysis was carried out by the Debye-Scherrer method. Figures 2, 4 and 5 show microstructures for the 57, 50 and 50% Si alloy after various annealing times and temperatures. Dilatometric curves for alloys containing lebeauite are shown in Figure 3. Some optical characteristics of lebeauite, facilitating the detection of its alpha and beta phases in alloys are given. The microhardness of the alpha and beta forms was found to be 630-780 and 750-850 kg/mm^2, respectively. The authors interpret their results in the following terms. In the first 15-20 min of annealing reaction I (decomposition of alpha into beta lebeauite and silicon) proceeds on the ε-phase and alpha-lebeauite phase boundaries, leading, in the presence of much monosilicide, to appreciable volume contraction of the system.

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80884

S/126/60/009/06/009/025
E111/E352

Investigation of the Transformations of Alpha-lebeauite

With increasing thickness of the "pure" beta-lebeauite edge increased resistance to diffusion of iron and silicon leads to reduction in the rate of solid-phase reaction II (reaction of ε-phase with alpha-lebeauite to give the beta-lebeauite). With the appearance of eutectoidal (beta-lebeauite + Si) silicon its reaction with ε-phase to form beta-lebeauite begins (reaction III, leading to volume contraction). When the temperature is lowered to 660 °C changed rate of reaction II is reflected in an appreciable reduction in specimen length. The kinetics of the process are very sensitive to monosilicide particle dispersion and distribution (and hence the specimen geometry and treatment).

There are 5 figures and 12 references, 10 of which are Soviet and 2 are English.

ASSOCIATION: Ural'skiy politekhnicheskiy institut im. S.M. Kirova (Ural Polytechnical Institute im. S.M. Kirov)

SUBMITTED: January 11, 1960

Card 3/3

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

GEL'D, P.V.; GERTMAN, Yu.M.

Initial neat of solution of liquid transition metals (fourth series) in liquid silicon. Fiz. met. i metalloved. 10 no.2:299-300 Ag '60. (MIRA 13:9)

1. Ural'skiy politekhnicheskiy institut im. S.M. Kirova. (Liquid metals) (Heat of solution)

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

S/126/60/010/005/027/030
E073/E535

AUTHORS: Gel'd, P. V. and Gertman, Yu. M.

TITLE: Volume Effects During Mixing of Liquid Silicon and Iron

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol.10, No.5, pp.793-794

TEXT: Data are given which were obtained in studying the density of liquid iron-silicon alloys at 1500°C. The measurements were carried out by hydrostatic weighing in a hydrogen atmosphere. The heats were produced in (corundum lined) crucibles. From the same material a float was produced which was fixed on a 2 mm alundum rod, which was connected to a dynamometer. The temperature was measured by means of a PtRh (6%) - PtRh (30%) thermocouple. After taking into consideration the corrections for expansion of the float and the surface tension of the alloy, the errors in determining the density did not exceed ± 1.0 to 1.5%. The following interpolation data were obtained on the density of the melts on the basis of experimental results and also by calculation, using the additivity law:

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S/126/60/010/005/027/030
E073/E535

Volume Effects During Mixing of Liquid Silicon and Iron

Volume, %	0	10	20	30	40	50	60	70	80	90	100
Exp. g/cm^3	2.49	3.10	3.80	5.00	5.85	6.25	6.42	6.60	6.77	6.90	7.02
Calculated g/cm^3	2.49	2.94	3.39	3.85	4.30	4.75	5.21	5.66	6.11	6.57	7.02

As was to be anticipated, the obtained data on the densities of the alloys illustrate clearly the earlier obtained dependence of ΔH on ΔV. The greatest compression is observed in the case of formation of an alloy, the composition of which corresponds to the monosilicide of iron (50 at.% or 42 vol.% Fe) for which ΔH = 11 cal/g·atom. In this case the experimental (5.95 g/cm^3) and the calculated (4.375 g/cm^3) densities differ by 1.575 g/cm^3 and the compression during the formation of the solution (from liquid components) reaches 36%. In view of this it is necessary to pay attention to some of the features of the structure of silicon and of iron monosilicide. It is known that the lattice of solid silicon contains large tetrahedral voids, the dimensions of which are

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S/126/60/010/005/027/030
E073/E535

Volume Effects During Mixing of Liquid Silicon and Iron

sufficient for accommodating iron atoms. The atom coordinates do not differ greatly from each other in liquid silicon and in the solid iron monosilicide and, therefore, the considerable volume effect of the mixing cannot be attributed to the closer packing of the atoms. Apparently the increased density of the melt is due to the more intensive interaction between the particles, which leads to the formation of quasi-molecules, for instance of the FeSi type, in which directional bonds exist (Refs. 2 and 10). It is particularly due to this reason that dissolution of iron in liquid silicon is accompanied not only by a great heat release and decrease in volume but also by an appreciable drop in the electrical resistance. Thus, if the process of fusion of silicon leads to delocalization of the interatomic bonds, introduction of iron leads to the formation of silicide quasi-molecules with strong directional bonds and the atoms getting closer, which corresponds to an increase in the density of the melt. There are 1 table and 11 references: 8 Soviet, 2 German and 1 English.

ASSOCIATION: Ural'skiy politekhnicheskiy institut imeni S.M.Kirova (Ural Polytechnical Institute imeni S.M. Kirov)

SUBMITTED: June 14, 1960

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APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

28 (5)

S/032/60/026/01/038/052
B010/B006

AUTHORS: Serebrennikov, N. N., [illegible]
R. P., Gel'd, P. V.

TITLE: Device for Calorimetric Measurements in Vacuum at High Temperatures

PERIODICAL: Zavodskaya laboratoriya, 1960, Vol 26, Nr 1, pp 109 - 111 (USSR)

ABSTRACT: A device for determining the heat content and the heat of phase changes of metals and alloys at high temperatures ranging from 100 to 1700°C is described. The device consists essentially (Fig 1) of a Skuratov calorimeter (Refs 1,2), a furnace for sample heating, and an electric measuring unit. The furnace is arranged above the calorimeter and is thermally insulated from it. The sample is suspended in the furnace by a thin molybdenum- (or tungsten-) wire. On attaining the required temperature, the wire is fused by switching on an electric contact. The sample drops into a conical groove in a copper block placed in the thermostat. The temperature of the sample is measured by a Pt-Pt/Rh thermocouple. Since the system is hermetically sealed, tests can be carried out in a corresponding vacuum by applying a VN-461 pre-vacuum pump or a N-5 high-vacuum pump. Slight

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amounts of alcohol vapors are introduced into the system to ensure rapid heat exchange between sample and copper block. Heat exchange is thus completed in 12-15 minutes. Electrolytic copper samples (99.95% Cu) were used to calibrate the device. The temperature function of the change $\Delta H_0^{t^\circ C}$ in heat content of highly alloyed EI481 steel was determined (Fig 2). Up to 900°C measurements were carried out using the nonhermetical device described in references 1, 2, above 900°C, the present device was used. Above 1350°C the differential method was applied. Up to 1350°, the courses of the curves of the heat content and the specific heat can be described by equations. The steel investigated has a melting interval of 1350 - 1470°C. The heat of [illegible] is 65 cal/°C and the specific heat of the molten steel at 1470 - 1550°C is 0.194 cal/°C. There are 2 figures and 4 references, 3 of which are Soviet.

ASSOCIATION: Ural'skiy politekhnicheskiy institut im. S. M. Kirova (Ural Polytechnic Institute imeni S. M. Kirov)

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

S/079/60/030/011/025/026
B001/B055

AUTHORS: Kusenko, F. G. and Gel'd, P. V.

TITLE: On the Heat of Formation of Niobium Pentoxide

PERIODICAL: Zhurnal obshchey khimii, 1960, Vol. 30, No. 11, pp. 3847-3848

TEXT: M. P. Morozova and L. L. Getskina, in their recently published report (Ref. 1), stated that the heat of formation of Nb_2O_5 from the elements is 472.5 kcal/mole. This value was obtained from the heat of formation of a preparation containing 98.5% Nb. At about the same time, the authors of the present publication studied the heats of formation of niobium oxides and niobium carbides (Ref. 2), using a metal which also contained 98.52% Nb. The heat of formation of Nb_2O_5 as determined by them, however, was 458.6 kcal/mole. The great difference between these two values (Refs. 1 and 2) induced the authors to carry out further calorimetric measurements using purer metal (99.01% Nb, 0.94% Ta, 0.04% O; no Ti, Fe, Si or C) which had been sintered close to its melting point. Two series

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of tests were carried out and the completeness of oxidation was checked after the tests. The mean values of the two test series were 99.33% and 99.10%. Corrections were made for incomplete oxidation and the Ta and O content of the initial product, assuming that tantalum is quantitatively transformed to Ta_2O_5 (499 kcal/mole, Ref. 3) and that the oxygen forms a solid solution in niobium with a heat of formation approximating that of the niobium oxide formed from the elements (Ref. 2). The calorimetric data and corrections are given in the table. From this it can be seen that the heat of formation of niobium pentoxide $\Delta H = -455.1 \pm 0.5$ kcal/mole, a result which is in agreement neither with the authors' previous results (Ref. 2) nor with those of G. L. Humpherey (Ref. 5). So far, no other exact studies on the present calorimetric question have been published, so that supplementary checking measurements will have to be carried out. There are 1 table and 5 references: 4 Soviet and 1 US.

ASSOCIATION: Institut khimii Ural'skogo filiala Akademii nauk SSSR (Ural Branch Institute of the Academy of Sciences USSR)

SUBMITTED: March 5, 1960

Card 2/2

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

GEL'D, P.V.

"Comparative" rates of reduction of tricalcium phosphate by gaseous reducing agents and solid carbon. Zhur. prikl. khim. 33 no.6:1413-1416 Je '60. (MIRA 13:8)

(Calcium phosphate) (Carbon)
(Reducing agents)

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

S/076/60/034/008/005/014
B015/B054

AUTHORS: Gel'd, P. V. and Krasovskaya, A. K. (Sverdlovsk)

TITLE: Mechanism of the Sulfide Corrosion of Iron. II. Structure of Sulfide Scale and Mechanism of the Process

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 8, pp. 1721-1727

TEXT: In connection with contradictory data in publications (Refs. 2-5) on the possibility of a diffusion of sulfur through the scale layer in the sulfide corrosion of iron, the authors investigated the macro- and microstructure of sulfide scale and the dependence of its structure on various parameters. The experiments were made on thick scale layers of differently shaped Armco iron samples with the use of an experimental procedure described in Ref. 6. To examine the macrostructure of scale, the authors studied the influence of temperature and of the duration of action of the sulfur vapor (p_{S_2} = 50 torr) on cylindrical samples (diameter 4 mm) at 500° - 800°C and a duration of 0.5 to 36 h. Two layers

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Mechanism of the Sulfide Corrosion of Iron. II. Structure of Sulfide Scale and Mechanism of the Process

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were found at temperatures above 600°C. X-ray structure and chemical analyses showed that both layers are single-phase, and consist of pyrrhotite crystals (Fig.). With the aid of an inert platinum marking it was found that the outer scale layer originates from iron diffusion, and the inner scale layer from the intrusion of sulfur. Experiments with convex and concave sample surfaces showed that sulfur diffusion is facilitated by an increase in curvature of the scale surface while it may be slowed down on compact samples. The influence of surface curvature depends on the volume ratio of the two pyrrhotite scale layers. An increase in the specific gravity of the lower scale layer with increasing curvature is explained by the rise in sulfur concentration in the pyrrhotite. Iron diffuses mainly as a Fe^{2+} cation, whereas sulfur diffuses in the quasiatomic state. It is assumed that a change in stoichiometric conditions in the pyrrhotite lattice effects a stronger rise of the diffusion coefficient of sulfur than of iron. Finally, the authors thank V. I. Arkharov and A. N. Orlov for their interest in the present investigation. B. Ya. Lyubov and D. Ye. Temkin are mentioned in

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APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

Mechanism of the Sulfide Corrosion of Iron. II. Structure of Sulfide Scale and Mechanism of the Process

S/076/60/034/008/005/014
B015/B054

the paper. There are 1 figure and 10 references: 7 Soviet, 1 US, and 2 German.

ASSOCIATION: Ural'skiy politekhnicheskiy institut im S. M. Kirova (Ural Polytechnic Institute imeni S. M. Kirov)

SUBMITTED: October 20, 1958

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

GEL'D, P.V.

115

PHASE I BOOK EXPLOITATION SOV/5411

Konferentsiya po fiziko-khimicheskim osnovam proizvodstva stali. 5th, Moscow, 1959.

Fiziko-khimicheskiye osnovy proizvodstva stali; trudy konferentsii (Physicochemical Bases of Steel Making; Transactions of the Fifth Conference on the Physicochemical Bases of Steelmaking) Moscow, Metallurgizdat, 1961. 512 p. Errata slip inserted. 3,700 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut metallurgii imeni A. A. Baykova.

Responsible Ed.: A. M. Samarin, Corresponding Member, Academy of Sciences USSR; Ed. of Publishing House: Ya. D. Rozentsveyg. Tech. Ed.: V. V. Mikhaylova.

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SOV/5411

Physicochemical Bases of (Cont.)

PURPOSE: This collection of articles is intended for engineers and technicians of metallurgical and machine-building plants, senior students of schools of higher education, staff members of design bureaus and planning institutes, and scientific research workers.

COVERAGE: The collection contains reports presented at the fifth annual convention devoted to the review of the physicochemical bases of the steelmaking process. These reports deal with problems of the mechanism and kinetics of reactions taking place in the molten metal in steelmaking furnaces. The following are also discussed: problems involved in the production of alloyed steel, the structure of the ingot, the mechanism of solidification, and the converter steelmaking process. The articles contain conclusions drawn from the results of experimental studies, and are accompanied by references of which most are Soviet.

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

S/137/62/000/003/002/191
A006/A101

15 2240

AUTHORS: Gertman, Yu. M., Gel'd, P. V.

TITLE: On thermochemistry of solid and liquid manganese silicides

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 3, 1962, 5, abstract 3A30 (V sb. "Fiz. khim. osnovy proiz-va stali", Moscow, AN SSSR, 1961, 52-67)

TEXT: The method of combustion in a cylinder was employed to determine the formation heat of solid Mn-Si alloys at 20°C, from the difference in the combustion heat of a mixture of components and alloys of the same composition. Electrolytical Mn (about 0.01% C, ~ 0.05% P, ~ 0.05% S) and crystalline Si (98.5% Si, 0.8% Fe, 0.5% Al, 0.2% Ca) were employed. To facilitate combustion of high-silicon alloys, Mn-metal powder was added. The substances were burnt in a corundum crucible with Al_2O_3 admixture; combustion was accompanied by the formation of products with variable Mn valence. A diagram shows the formation heat in the Mn-Si system. For MnSi monosilicide the heat of formation is 17.0 kcal/mole. In a high-temperature calorimeter the authors determined the heat of solid Si dissolving in liquid Mn, and of solid Mn in liquid Si. Calibration of

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heat effects was performed by the preliminary addition into the calorimeter of defined quantities of a solid solvent (Mn or Si). The heats of mixing liquid Mn and Si at 1,470°C were determined. The mixing heats are exothermal ones, they are described by a symmetrical curve with a maximum of 9.35 kcal/g-atom at 50 at %, and do not obey the equation for regular solutions. Concepts are presented on micro-heterogeneity of Mn-Si smelts and the presence of MnSi pair complexes in them. It is experimentally shown that the initial heats of Si dissolving in commercial Mn, Fe-Mn and Si-Mn differ slightly from those established for pure synthetic alloys.

Yu. Golutvin

[Abstracter's note: Complete translation]

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

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S/137/62/000/004/001/201
A006/A101

5.2200

AUTHORS: Kusenko, F. G., Gel'd, P. V.

TITLE: On thermochemistry of niobium oxides and carbides

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 6, abstract 4A23 (V sb. "Fiz-khim. osnovy proiz-va stali", Moscow, AN SSSR, 1961, 41 - 51)

TEXT: The heats of formation of Nb oxides and carbides are determined by combustion in a cylinder; heat capacities are measured by the method of mixing in an adiabatic calorimeter (the substances were placed in hermetically soldered Pt-Ph-ampoules). Lower Nb oxides were prepared from Nb_2O_5 (0.001% Si, 0.001% Mg, 0.01% Fe, 0.001% Al, 0.01% Zn, 0.1% Ti, 0.001% Cu) and Nb metal (98.52% Nb, 0.3% Ta, 0.1% Ti, 0.05% C, 0.028% N and about 1% O). For the preparation of carbides acetylene carbon black was used. The following results were obtained: for Nb_2O_5 $\Delta H^0_{298} = -458.6 \pm 0.4$ kcal/mole; $C_p = 38.76 + 3.54 \cdot 10^{-3} T - 7.318 \cdot 10^5 T^{-2}$ cal/degree·mole (298 - 1,500°K); for NbO_2, $\Delta H^0_{298} = -191.7 \pm 0.4$, $C_p = 14.681 + 6.156 \cdot 10^{-3} T - 2.421 \cdot 10^5 T^{-2}$ (298 - 1,010°K), respectively. At about

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1,040°K, NbO_2 is transformed, which is confirmed by measuring the electric conductivity and thermal expansion. The transformation heat $\Delta H_{1,040}$ = 0.69 kcal/mole. In the 1,080 - 1,500°K range, the heat capacity of NbO_2 is constant and equal to 21.28 cal/degree·mole; for NbO ΔH^o_{298} = - 97.7 + 0.5 kcal/mole. The heats of formation of higher and lower Nb carbides within the ranges of homogeneity were equal to: for $NbC_{0.72-1.00}$ ΔH^o_{298} = - 17.5 kcal/g-atom (Nb + C) and for $NbC_{0.39-0.51}$ ΔH^o_{298} = - 14.5 kcal/g-atom (Nb + C). Heat capacities of carbides of three compositions within the 298 - 1,500°K range are expressed by equations (in cal/degree/mole): for $NbC_{0.964}$, $C_p = 12.10 + 3.273 \cdot 10^{-4}T - 3.472 \cdot 10^5 T^{-2}$; for $NbC_{0.867}$, $C_p = 11.24 + 7.184 \cdot 10^{-4}T - 3.429 \cdot 10^5 T^{-2}$ and for $NbC_{0.749}$, $C_p = 10.44 + 1.172 \cdot 10^{-3}T - 3.40 \cdot 10^5 T^{-2}$. The agreement of the empirical equations of heat capacity with experimental data is about ±1%.

Yu. Golutvin

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[Abstracter's note: Complete translation]

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

S/137/62/000/004/002/201
A006/A101

AUTHORS: Gel'd, P. V., Alyamovskiy, S. I., Matveyenko, I. I.

TITLE: Determining the application range of the principle of consecutive transformations, set up by Academician A. A. Baykov

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 6 - 7, abstract 4A26 (V sb. "Fiz-khim. osnovy proiz-va stali", Moscow, AN SSSR, 1961, 157 - 167)

TEXT: The substances employed were prepared from two V_2O_5 batches containing about 0.0007% heavy metal oxides and <0.1% SiO_2. A thorough investigation of intermediate products of V_2O_5 reduction with hydrogen, obtained at 200 - 1,200°C, revealed the presence of V_6O_{13}, V_2O_4 and V_2O_3. In none of the samples whose reduction degree varied from 0 to 38.6%, the presence of $VO_{1.75}$, $VO_{1.80}$, $VO_{1.84}$ and $VO_{1.86}$ was revealed. Phases $VO_{1.67}$ (or $VO_{1.87}$) are present, if any, in small amounts so that they cannot be reliably identified. It was established that by V_2O_5 reduction with hydrogen, single-phase oxide preparations with compositions ranges between V_2O_5 and V_2O_3 can not be obtained. The authors state that

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A006/A101

Determining the application range of...

A. A. Baykov's principle on consecutive transformation is applicable to the case of relatively slow processes with relatively slow interactions, occurring in systems which are characterized by substantial differences in the composition and structure of intermediate phases. At a rapid development of the process in systems containing phase constitutents of close compositions and structures, some of them can not be formed. There are 54 references.

T.Kolesnikova

[Abstracter's note: Complete translation]

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

S/137/62/000/004/133/201
A060/A101

18.8100

AUTHORS: Serebrennikov, N. N., Krentsis, R. P., Gel'd, P. V.

TITLE: Apparatus for determining the heat capacity of solid and molten alloys and steels

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 87-88, abstract 4I528 (V sb. "Fiz.-khim. osnovy proiz-va stali". Moscow, AN SSSR, 1961, 287-292)

TEXT: The description is given of the mechanism of a vacuum adiabatic calorimeter for determining the heat capacity of solid and molten alloys and steels. The main parts of the installation are the calorimeter itself, the furnace for heating the specimens, and the electric measurment circuit. The heating of the specimen up the required temperature is realized in the furnace fixed above the calorimeter. The heater, made of stainless steel or Mo-sheet is attached by clamp rings to mutually isolated flanges serving as the current leads. The length of the heater is about 280 mm, the diameter is about 30 mm. The specimen or a crucible with the specimen is suspended on a thin Mo- or W-wire from the Mo electrodes fixed in a magnesite plug. To the electrodes are

Card 1/2

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connected contact springs which are pressed against the flanges connected to the autotransformer; at the required instant the circuit is closed, the wire is burned through and the specimen falls into the calorimeter. The temperature of the specimen is measured by a Pt/Pt - Rh thermocouple. The hermetic closure of the installation is ensured by rubber seals. The exhaustion of air in the system is carried out by low-vacuum (ВН-461 [VN-461]) and high-vacuum (Н-5 [N-5]) pumps. The methods of calibrating and checking the calorimeter are set forth. Data are cited relative to the course of temperature variation of the heat content of steel grades ЭИ 572 and 18ХНВА (EI572 and 18KhNVA). There are 7 references.

Ł. Fridman

[Abstracter's note: Complete translation]

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

88502

18.8100

S/149/61/000/001/004/013
A006/A001

AUTHORS: Serebrennikov, N.N., Gel'd, P.V., Krentsis, R.P.

TITLE: Heat Content of Ferroniobium and Ferrotitanium at High Temperatures

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Tsvetnaya metallurgiya, 1961, No. 1, pp. 82 - 87

TEXT: The specific heat content of ferroniobium and ferrotitanium as a function of variable temperatures was studied within a range of 0 - 1,600°C (Ref. 1, 2, 3) in non-hermetic and vacuum calorimeters. The data obtained were reduced to zero degrees (standard conditions) on the basis of auxiliary tests made with the aid of an ice cooler (Ref. 1). Results obtained are given in the table below:

Results of measuring ΔH_0^t of ferroniobium and ferrotitanium

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S/149/61/000/001/004/013
A006/A001

Heat Content of Ferroniobium and Ferrotitanium at High Temperatures

Феррониобий Ferroniobium °C	ΔH_0^t, кал/г cal/g	Ферротитан Ferrotitanium °C	ΔH_0^t кал/г cal/g
20,3	1,929	21,06	2,617
27,8	2,698	26,95	3,279
99,3	9,750	166,8	21,25
202,6	20.41	199,4	25,66
303,5	30,98	205,9	26,51
403,0	42,45	401,1	54,16
501,1	54,36	602,5	85,03
508,1	52,75	702,6	101,6
599,8	65,25	800,5	118,7
707,2	77,40	901,3	137,7
805,7	91,49	1001	158,3
917,5	105,6	1100[1]	174,9
1014	117,1	1103[1]	175,8
1107	131,5	1111[1]	175,4
1212[1]	140,6	1202[1]	190,6
1300[1]	158,4	1300[1]	227,2
1400[1]	168,9	1400[2]	280,8
1500[1]	192,6	1450[2]	347,6
1550[1]	195,6	1505[2]	354,8
—	—	1600[2]	379,1

1 Tests made on a vacuum device without crucibles

2 Tests made on a vacuum device with crucibles

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A006/A001

Heat Content of Ferroniobium and Ferrotitanium at High Temperatures

Commercial ferroniobium melt of the following composition was investigated (in %): 58.55 Nb; 17.09 Fe; 7.40 Ti; 10.91 Si; 1.17 Zr; 0.53 Cr; 3.34 Al; 0.09 P; 0.042 Cu and 0.011 S. The temperature dependence of the experimental heat content, illustrated by Graph 1, shows that in the temperature range investigated, no noticeable anomaly of the heat content was observed. The experimental data can be expressed by the empiric formula $\Delta H^{T}_{273.1} = -30.28 + 94.55 \cdot 10^{-3}\, T + 14.67 \cdot 10^{-6}\, T^2 + 920 \cdot T^{-1}$ cal/g which, with an accuracy of up to 1.5%, is correct for a range of 273 - 1,873°K. It results from this equation that the true specific heat capacity of ferroniobium is $C_p = 94.55 \cdot 10^{-3} + 29.34 \cdot 10^{-6}\, T - 920 \cdot T^{-2}$, cal/g. degree in the same temperature range. Using characteristics of α Ti which are approximately equivalent to Ti properties in the alloy, and taking into account the heat content of silicon and niobium, a satisfactory agreement between experimentally determined ΔH values and those calculated by the rule of additivity, Formula (6), is obtained: X

$$\Delta H_{add} = 0.59\,\Delta H_{Nb} + 0.11\,\Delta H_{Si} + 0.19\,\Delta H_{\alpha Fe} + 0.04\,\Delta H_{Al} + 0.07\,\Delta H_{\alpha Ti}$$

The calculation method described is recommended to determine the heat content of commercial ferroniobium. The heat content of ferrotitanium containing 1) (in %):

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A006/A001

Heat Content of Ferroniobium and Ferrotitanium at High Temperatures

27.5 Ti; 6.74 Al; 4.30 Si; 0.051 C; 0.025 P; 0.020 S and 2) 19.46 T; 3.07 Si; 3.66 Al; 0.08 C; 0.03 S and 0.04 P, was investigated in a vacuum calorimeter at temperatures over 1,000°C and in a non-hermetic calorimeter at lower temperatures. The temperature dependence of the heat content is illustrated by Graph 2. At a temperature over 1,270° when a liquid phase was formed, the heat content was determined by the differential method using alundum crucibles whose temperature dependence of heat capacity was previously studied for 700 to 1,600°C. The latent melting heat was found to be 115 cal/g, which was somewhat higher than that recommended by Kubashevskiy and Evans (95 ∓ 10 cal/g) (Ref. 4). To check the applicability of the Kopp-Neuman law, data on the temperature dependence of ΔH_{Fe} (Ref. 4); ΔH_{Si} (Ref. 5), ΔH_{Al} (Ref. 4), and $\Delta H_{\gamma Ti}$ (Ref. 9) (see Figure 2) were used. The calculation of the additive sum of heat contents was performed for an alloy of simplified composition (27.5% Ti; 61% Fe; 4.5% Si and 7% Al). Calculated values of $\Delta H_{1\ add}$ and experimentally values (ΔH_{exp}) disagree by about 13% at 600 - 800°C. Therefore experimental data were compared with characteristics of high temperature iron and titanium modifications using for γ Fe results given by Darken and Smith (Ref. 10). Results obtained from additional tests with technically pure Ti and Ti iodide (Figure 4) show that over 880°C the heat content of

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A006/A001

Heat Content of Ferroniobium and Ferrotitanium at High Temperatures

β-Ti increases linearly with temperature, i.e. its heat capacity does not depend on temperature and amounts to 0.164 cal/g.degree. These measurements prove the insufficient accuracy of Backhurst's data (Ref. 9) obtained with the aid of a high-temperature adiabatic calorimeter. The results obtained by the authors are in a better agreement with data given by Golutvin (Ref. 11) and can be successfully employed to check the applicability of the Kopp-Neumann law. However, the discrepancy between experimental data and those obtained by the rule of additivity is still 10% at 600 - 800°C and is explained by the arbitrary selection of the heat content of Ti, Fe and Al. The empirical processing of experimental results makes it possible to recommend the following equation to calculate the heat content of ferrotitanium:

$$H^T_{273.1} = -25.61 + 98.09 \cdot 10^{-3} T + 34.01 \cdot 10^{-6} T^2 - 1012\, T^{-1} \text{ cal/g}$$

X

correct with 1.2% accuracy for a temperature range of 273 - 1,573°K. Consequently the heat capacity of the alloy varies with temperature in accordance with the equation $C_p = 98.09 \cdot 10^{-3} + 68.02 \cdot 10^{-6} T + 1012\, T^{-2}$ cal/g . degree. The data submitted show the connection of thermophysical and structural characteristics of alloys and demonstrate the errors which may arise when using the rule of additivity

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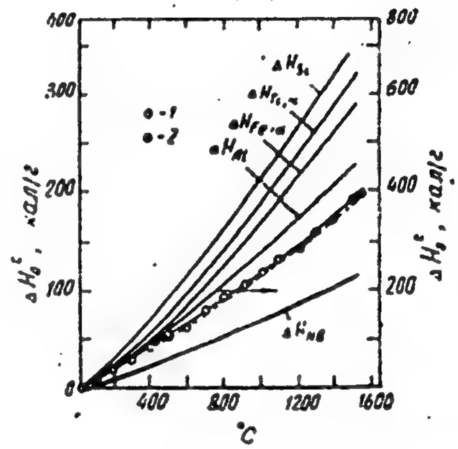
A006/A001

Heat Content of Ferroniobium and Ferrotitanium at High Temperatures

without previously establishing its applicability.

Figure 1

Polytherm ΔH_{exp} of ferroniobium from results of tests made on non-hermetic (1) and vacuum (2) devices. Dotted line - additive curve



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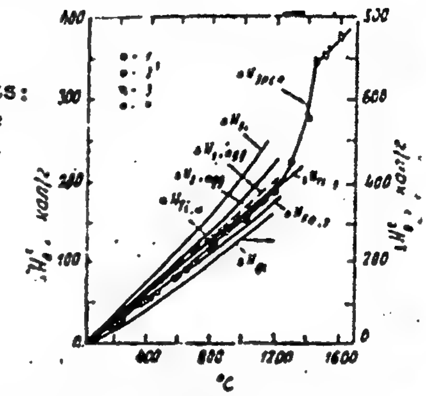
Heat Content of Ferroniobium and Ferrotitanium at High Temperatures

Figure 2



Polytherm ΔH_{exp} of ferrotitanium obtained from tests: 1) on a non-hermetic device; 2 - on a vacuum device without crucibles; 3 - on a vacuum device with crucibles; 4 - Serebrennikov's and Gel'd's data (7). Dotted line - additive curves.

There are 1 table, 4 figures and 11 references: 9 Soviet and 2 English.

ASSOCIATIONS: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute) Kafedra fiziki (Department of Physics)

SUBMITTED: April 25, 1960

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

S/148/61/000/003/001/015
A161/A133

AUTHORS: Serebrennikov, N. N., Gel'd, P. V., Krentsis, R. P.

TITLE: The enthalpy and melting heat of steels. Medium-alloy and high-alloy steels

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no. 3, 1961, 5 - 10

TEXT: The article is the second of two presenting the results of an experimental investigation. The first, by same authors, contained data on carbon and low-alloy steels (Ref. 5: Izv. vyssh. uch. zavedeniy. Chernaya metallurgiya, no. 11, 1960). A description of the testing equipment and techniques had been given in three former publications, two in 1954, and the latest in 1960 (Ref. 3: Zavodskaya laboratoriya, no. 1, 1960, same authors). Seven steel grades were studied, four of austenitic and three of ferrite-carbide base type. References are made to parallel studies by J. Pattison and T. Lonsdale (Ref. 4: J. Iron and Steel Inst., 183, 1956, 284) and I. Backhurst (J. Iron and Steel Inst., 189, 1958, 124). Alundum crucibles and the differential method were used for studies at temperatures above 1,300 - 1,400°C, and the enthalpy

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variations were determined with an ice chiller. The chemical composition of the investigated 7 steel grades is given in a table. A drastic difference was stated in the behavior of austenitic and ferrite-carbide base steel types, which is explained by the different heat capacity of gamma iron in austenitic steel and alpha iron in the ferrite-carbide grade (prior to the eutectic transformation temperature). No comparison is made with the data obtained by the mentioned non-Soviet experiments and a German one (Ref. 7: P. Oberhoffer, W. Grosse, Stahl u. Eisen, 47, 1927, 570) in view of different steel compositions tested, but considerable errors in the I. Backhurst data are pointed out. The conclusion is made that obviously the melting heat may vary considerably with variations of the steel composition. In the austenitic group the heat capacity of metal obviously depends mainly on the nickel content. The other conclusion is that the additivity rule can be considered as verified and the Kopp-Neumann rules may be applied for steel in the solid stage. There are 3 figures, 5 tables and 7 references: 4 Soviet-bloc and 3 non-Soviet-bloc. The two references to English-language publications read as follows: J. Pattison, T. Lonsdale, J. Iron and Steel Inst., 183, 1956, 284, and I. Backhurst, J. Iron and Steel Inst., 189, 1958, 124.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (The Ural Polytechnic Institute)

SUBMITTED: June 11, 1960

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GEL'D, P.V. (Sverdlovsk); PETRUSHEVSKIY, M.S. (Sverdlovsk)

Isotherm of the surface energy of liquid silicon-iron alloys. Izv. AN. SSSR. Otd. tekh. nauk. Met. i topl. no.3:160-162 My-Je '61. (MIRA 14:7)

(Surface energy) (Liquid metals)

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S/136/61/000/004/003/006
E021/E135

AUTHORS: Shveykin, G.P., and Gel'd, P.V.

TITLE: The Production of Metallic Niobium from an Oxide-Carbide Mixture

PERIODICAL: Tsvetnyye metally, 1961, No. 4, pp. 39-42

TEXT: The first stage of the two-stage process for the thermal production of niobium is the production of niobium carbide from niobium pentoxide and carbon:

$$Nb_2O_5 + 5C = 1.42NbC_{0.8} + 0.573NbO_2 + 3.854\ CO$$

Earlier work of the authors related to the kinetic characteristics of the reaction at low pressures (Refs. 3 and 4) and to X-ray structural investigations (Ref.5). The present article gives results of studies of the reaction at atmospheric pressure and the composition of the intermediate products in conditions used in practice and also results on experiments of the production of metallic niobium. The starting materials were niobium pentoxide and acetylene black. Experiments were carried out in a resistance

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E021/E135

The Production of Metallic Niobium from an Oxide-Carbide Mixture

furnace. The kinetics were followed by the decrease in weight. Metallic niobium was prepared in a laboratory vacuum furnace. The effect of temperature (°C) on the kinetics of the reaction at atmospheric pressure [decrease in weight of the charge (niobium pentoxide and carbon) in relative units] is shown in the figure. The reaction begins at 900 °C. The loss in weight increases with increasing temperature up to 1300 °C. The phase analysis of the products of reduction are given in the table. For the preparation of metallic niobium, niobium pentoxide was added (5% excess). The charge was carefully mixed and 9% solution of rubber in benzene was added. The mixture was pressed into mouldings with 4.5 T/cm^2 and they were dried at 120 °C. It was found necessary to give a preliminary heat-treatment to the mouldings at 1350-1400 °C in an argon atmosphere to give sufficient strength and conductivity. The samples could then be heated by high frequency induction or by passing an electrical current through them. By heating to 1450-1500 °C in vacuo, holding at this temperature for 30 minutes and increasing the temperature to 1750 °C, porous mouldings of

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E021/E135

The Production of Metallic ....

metallic niobium containing 99.4-99.8% Nb, 0.5-0.1% C and less than 0.1% O_2 were obtained.
There are 1 figure, 1 table and 6 references: 5 Soviet and 1 English.

Figure

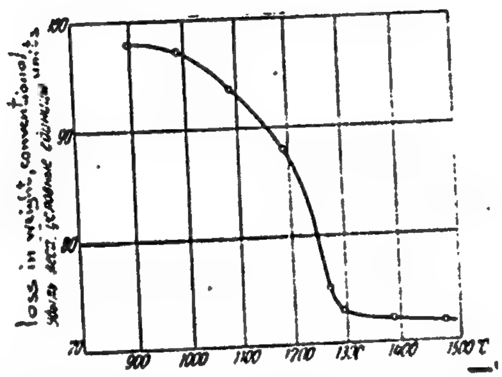

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Table

Phase composition of the products of reduction at 1 atm

Temperature, °C	1400	1600	1800
Time of experiment (min)	20	10	10
% reduction	82.4	85.0	86.2
Nb content, %	84.0	85.2	87.5
Lattice parameter of the carbide	4.445±0.001	4.444±0.001	4.443±0.002
Composition of product	$NbC_{0.83\pm0.01}$ + NbO_2 *	$NbC_{0.83\pm0.01}$ + NbO_2	$NbC_{0.76\pm0.02}$ + NbO_2

*The specimen contained a slight quantity of free carbon

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18.8100 25547 S/149/61/000/004/001/008
A006/A101

AUTHORS: Serebrennikov, N. N.; Gel'd, P. V.

TITLE: Heat content and heat capacity of titanium at high temperatures

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Tsvetnaya metallurgiya, no. 4, 1961, 80-86

TEXT: Heat content and heat capacity of titanium were studied by a number of authors. Interesting results were obtained by Backhurst [Ref. 6: I. Backhurst, J. Iron Steel Inst., 189, 124 (1958)] who determined true heat capacity of Ti at 600 to 1,080°C, and by Golutvin [Ref. 7: Yu. M. Golutvin, ZhFKh, 33 1798 (1959)] who studied the temperature dependence of Ti-content from 114.8 to 1128°C. However, the results obtained by these authors were considerably different for both low and high temperatures. Therefore it was imperative to carry out new measurements, since similar differences had been also observed in data presented by other authors. Information is given on the results of measurements performed. Commercial titanium (grade ВТ-1Д [VT-1D]) containing 0.08% Fe, 0.07% Si, 0.05% C, 0.03% N, 0.02% O and 0.005% H, and iodide Ti with not over 0.04% impurity content, were investigated. The temperature dependence of changes in the heat

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A006/A101

Heat content and heat capacity ...

content $\Delta H_{t_1}^{t_2}$ was investigated in an adiabatic high-temperature vacuum calorimeter. At up to 1,200°C the measurements were made without additional protection of the metal, and at higher temperatures by the differential method with specimens in quartz ampoules. A comparison of the values determined with thermal characteristics of quartz glass permitted the calculation of the Ti heat content. Moreover, the dependence of heat content in the range of 0 to 27°C (ΔH^{t_1}) was determined in a non-hermetic device and an ice thermostate. The temperature dependence of VT-1D Ti ($\Delta H_{273.1}^{T^oK}$) was studied at temperatures from 0 to 1,400°C. In the range of α Ti stability, i.e. below 850°C, the heat content of commercial Ti raised monotonously with higher temperatures (C_{p298K} = 0.1247). At 850 - 880°C anomalies were observed analogous to those of phase transformations of the second order; $\Delta H_{273.1}^{T^oK}$ increased abnormally rapidly as a result of the polymorphous transformation of Ti; heat capacity was highest at about 860°C(close to 0.787 cal/g.degree or 36.6 cal/degree. g-at). Above the transformation point heat content of β Ti changes linearly with temperature within 900 - 1,400°C ($c_{p,\beta}$ = 0.167 cal/g.degree). The heat content of iodide Ti was studied within 0 to 650°C, i.e. almost at its melting point. At 0 - 840°C heat content increases smoothly with rising temperature. From 850 - 880°C it raises abruptly and heat capacity attains its maximum value near 865°C (about 1.6 cal/g.degree). Within

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Heat content and heat capacity . .

880 - 1,650°C heat content of β Ti changes linearly with temperature. It
follows that $C_{p,\beta}$ = 0.1672 cal/g.degree (about 8.0 cal/degree.g-at) and does
not depend on temperature. This value is below that corresponding to the meta-
stable α Ti at 880°C. As a result of $\alpha \to \beta$ transformation, heat capacity of Ti
decreases spontaneously by over 10%. It is concluded that the thermal character-
istics of iodide and commercial Ti are not very different. The information
includes a discussion on data presented by other authors. There are 2 tables,
2 figures and 14 references: 9 Soviet-bloc and 5 non-Soviet-bloc.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute)
Kafedra fiziki (Department of Physics)

SUBMITTED: October 24, 1960

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32224

S/139/61/000/004/019/023
E032/E314

26.2532

AUTHORS: Korshunov, V.A. and Gel'd, P.V.

TITLE: The electrical conductivity and thermoelectric power of manganese-silicon alloys. II. Commercial alloys containing MnSi, $MnSi_2$ and Si

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Fizika no. 4, 1961, 146 - 153

TEXT: The present authors have shown in a previous paper (Ref. 1 - this journal, no. 6, 29, 1960) that certain manganese-silicon alloys have properties characteristic of extrinsic p-type semiconductors whose intrinsic conductivity appears only above 600 °C. This result was established experimentally for low-silicon Mn-Si alloys containing Mn_3Si and Mn_5Si_3 as phase components. This suggested that Mn-Si alloys with higher silicon concentrations were in fact semiconducting materials. The aim of the present work was to establish experimentally whether this was the case. Measurements were carried out of the conductivity (σ) and the thermoelectric power (α) for a number of specimens X

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E032/E314

The electrical conductivity ...

containing MnSi, $MnSi_2$ and Si at high temperatures. The methods employed to measure these quantities were the same as in Ref. 1. The alloys were prepared from Kp-O (Kr-O) silicon and electrolytic manganese. The specimens contained between 34.33 and 68.17% silicon (by weight) and were investigated in the temperature range 0 - 1 350 °C. It was found that for alloys containing less than 52.16% silicon, the $\ln\sigma$ versus 1/T curve passes through a minimum and then rises again. The minimum occurs in the neighbourhood of 550 °C. This minimum disappears with higher concentrations of silicon and is replaced by a slight plateau. $d\sigma/dT$ is always greater than or equal to zero for the latter alloys. The temperature-dependence of the thermoelectric power is quite complicated. The thermoelectric power is found to increase, up to about 500 °C, and then decreases quite rapidly. For alloys containing less than 52.16% silicon (by weight) the thermoelectric power is positive (in the temperature range 0 - 1 000 °C), while the conductivity is of the p-type. The values of the thermoelectric power are much lower for higher concentrations of silicon and decrease with increasing Si

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E032/E314

The electrical conductivity ...

concentration. The thermoelectric power changes sign and becomes negative at low and high temperatures. It is concluded that MnSi and $MnSi_2$ are characterized by predominantly p-type conductivity, while the conductivity of Si is largely of the n-type. There is a tendency to transition from p type to n-type conductivity above 600 °C in all the above alloys. Very approximate calculations indicate that for alloys containing 42 to 48% of Si, $n_p = 8 \times 10^{19}$ cm^{-3} and the mobility is approximately 30 cm^2/V.sec. This result applies to low temperatures, e.g. below 500 °C. Finally, approximate calculations are reported of the parameter $Z = \alpha^2 \sigma / k$, where k is the thermal conductivity. It is found that for the alloys with 42.07 and 44.52% silicon, the average value of Z is 0.206 and 0.2027 - 0.2028 deg^{-1}, respectively.

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32224

The electrical conductivity ... S/139/61/000/004/019/023
E032/E314

There are 4 figures and 26 references: 22 Soviet-bloc and 4 non-Soviet-bloc. The three English language references mentioned are: Ref. 8: R.W. Powell, Phil. Mag., 44, 372, 1953; Ref. 10: R.W. Keges, Phys. Rev., 84, 367, 1951 and Ref. 16: L.P. Hunter, Phys. Rev., 91, 579, 1953.

ASSOCIATION: Ural'skiy politekhnicheskiy institut imeni S.M. Kirova (Ural Polytechnical Institute imeni S.M. Kirov)

SUBMITTED: February 15, 1960

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

S/149/61/000/005/003/008
A006/A101

AUTHORS: Lyubimov, V. D., Gel'd, P. V.

TITLE: Equilibrium during reduction of niobium pentoxide with hydrogen

PERIODICAL: Izvestiya vysschikh uchebnykh zavedeniy, Tsvetnaya metallurgiya, no. 5, 1961, 145-151

TEXT: In previous studies made on the equilibrium in the Nb-O-H system, no special precautions against thermodiffusional complications had been taken. This may entail serious errors. Therefore new experimental investigations were carried out with refined niobium pentoxide containing over 99.9% Nb_2O_5 and roasted at 1,200°C. Niobium dioxide was prepared by the reduction of pentoxide in a hydrogen flow at 1,100°C. For the experiments either sintered $Nb_2O_5 + NbO_2$ tablets were used, or niobium pentoxide partially reduced with hydrogen. The equilibrium in these systems was studied by the circulation method at 900, 950, 1,000, 1,050 and 1,100°C and by the method of weight variation with a gas mixture where $P_{H_2O}^{-1} \cdot P^{-1}_{H_2} \approx 0.04$ at 880, 890, 910 and 940°C, and where it was $\approx$ .1, at 1,070, 1,090, 1,110 and 1,130°C. The results of measurements made by the aforementioned methods are compared between each other and with literature data

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(Fig. 4). The values of equilibrium constants obtained by both the circulation and weight variation methods are in an excellent agreement. This confirms additionally the rapid interaction of hydrogen with higher Nb oxides and the attaining of an equilibrium in the system. Experimental data in the 900 - 1,000°C temperature range are well described by the empirical formula

$$\lg K = -\frac{14400}{4.575T} + 1.29 \approx -\frac{3150}{T} + 1.29$$

Hence it follows that $\Delta H_{1,000^{\circ}C} = 14,400$ cal/mole and $\Delta Z \approx 14,400 - 5.9\,T$ (2). Numerical values of equilibrium constants obtained at 900 - 950°C are in a satisfactory agreement with data from reference 1 [P. Süe, C. r Acad. Sci. 208, 1088 (1939)] but rather in contradiction with those of references 2 [H. Schaefer, G Breil, Z. anorgan. allgem. Chem. 267, 265, 1952] and 3 [G. Grube, O. Kubashevskiy, K. Zwiauer, Z. Elektrochem. 45, 1939. 882, (1949)]. This points to a systematic error in the experiments of reference 3, whereas the difference in the equations obtained by the authors and given in reference 8 [F. G. Kusenko, P. V. Gel'd, Izv. VUZ, Tsvetnaya metallurgiya, no. 2, 43, 1961] is explained by the difference in the thermal effects. There are 4 figures, 1 table, and 11 references: 6 Soviet-bloc and 5 non-Soviet-bloc.

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Equilibrium during reduction ...

S/149/61/000/005/003/008
A006/A101

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute)

SUBMITTED: December 17, 1960

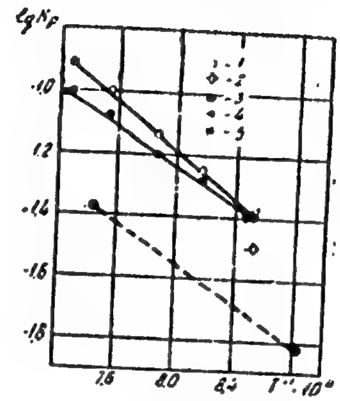

Fig. 4: The relation $K_p = P_{H_2O} \cdot P_{H_2}^{-1}$ from data presented by Sue (1), Scheafer and Breil (2), Grube, Kubashevskiy and Zwianer (3); 4 and 5 are the results of the present investigation with the use of the circulation method and the method of weight variation, respectively.

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33179

15 2600
18 7500

S/180/61/000/006/013/020
E026/E335

AUTHORS: Gel'd, P.V. and Lyubimov, V.D. (Sverdlovsk)

TITLE: Diffusion of Nb and C in Nb and its carbides

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Metallurgiya i toplivo, no. 6, 1961, 119 - 126

TEXT: Diffusion in Nb and its carbides has been little studied, in spite of the fact that it is of considerable interest for judging the mechanism of the carbon-thermal reduction of oxides, of high-temperature oxidation of the metal, of the conditions of recrystallization and other processes associated with the migration of atoms. Therefore, the authors investigated the diffusionability of the components in the condensed phases of the system Nb-Co and in this paper the results are described which were obtained in studying the diffusion and self-diffusion of niobium and carbon in Nb and its carbides. In the investigations radioactive tracer techniques employing the isotopes Nb^{95} and C^{14} were used.

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E026/E335

Diffusion of ....

The Nb used in the experiments was of 99.01% purity and it contained 0.94% Ta and 0.04% O; Ti, Fe, Si and C were not detected. The pores were closed and did not intercommunicate. The total volume of the pores was estimated at 13%, based on the results of measurement of the real and apparent specific weights.. The niobium carbides were synthesized from the niobium oxides and from acetylene black. The obtained powders were pressed into rods and sintered in a vacuum furnace at 1 600 - 1 700 °C. Homogenization and final sintering were at 2 200 °C for 20 hours. The self-diffusion of Nb^{95} into Nb and its carbides was determined on sintered metal with total porosities of 13 and 10%, respectively, in the temperature range 1 700 - 2 100 °C. The activation energy for self-diffusion of Nb is found to be ~ 84.5 kcal/g.atom. Samples prepared by sintering Nb powder show a little difference to those from forgings. The activation energy of diffusion of Nb in NbC is found to be ~55 kcal/g.atom. The diffusion of C was studied in Nb, the hexagonal carbide $NbC_{0.5}$ and the

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E026/E335

Diffusion of ....

face-centred cubic carbides $NbC_{0.75}$ and $NbC_{0.98}$. Activation energies for all these processes were found to be ~ 32 - 33 kcal/g.atom, although that for $NbC_{0.5}$ was less than that for $NbC_{0.98}$, probably due to the larger number of vacant sites in the hexagonal structure. The relationship of activation energy to the melting points, heats of sublimation and recrystallization temperatures is discussed and the validity of the derived relationships is shown by comparing with values for V and Ta. On the basis of the obtained data and semi-empirical relations, the heat of sublimation of Ta was estimated at 224 kcal/g.atom and the energy of activation of the process of self-diffusion of V was estimated at 68 kcal/g.atom. There are 5 figures, 3 tables and 18 references: 13 Soviet-bloc (two of which are translations from non-Soviet-bloc publications) and 5 non-Soviet-bloc. The four latest English-language references quoted are: Ref. 1: W.B. Pearson - A Handbook of Lattice Spacing and Structures of Metals and Alloys, L-NT, 1958;

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E026/E335

Diffusion of ....

Ref. 10: O. Kubaschewski, E. Evans - Metallurgical Thermochemistry, London-New York, 1958; Ref. 12: R. Speiser, P. Blackburn, H. Johnston - J. Electrochem. Soc., 1959, 106, 52; Ref. 16: R.W. Powers, M.V. Doyle - J. Metals, 1957, 9, (10), s.2, 1285.

SUBMITTED: May 4, 1961

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

SKRIPOVA, Ye.A.; PEREVEZENTSEV, B.I.; GEL'D, P.V.

Calcium and aluminum distribution in lebeauite alloys according to the data of a local spectral analysis. Trudy Ural.politekh. inst. no.14:115-119 '61. (MIRA 16:6)
(Iron-silicon alloys—Spectra) (Calcium) (Aluminum)

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

KUPROVSKIY, B.B.; GEL'D, P.V.

Heat conductivity of α-titanium. Trudy Ural.politekh.inst. no.14:153-154 '61. (MIRA 16:6)
(Titanium—Thermal properties)

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

KORSHUNOV, V.A.; GEL'D, P.V.

Electric conductivity and the thermoelectromotive force of manganese silicides. Trudy Ural.politekh.inst. no.14:164-165 '61. (MIRA 16:6)
(Manganese-silicon alloys--Thermoelectric properties)

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"

"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

GEL'D, P.V.; ALYAMOVSKIY, S.I.; MATVEYENKO, I.I.

β-, δ- and ζ- phases of the vanadium - oxygen system. Zhur.strukt.-khim. 2 no.3:301-307 My-Je '61. (MIRA 15:1)

1. Institut khimii Ural'skogo filiala AN SSSR, Sverdlovsk.
(Vanadium oxide)

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24939

S/192/61/002/004/002/004
D217/D306

15.2240

AUTHORS: Alyamovskiy, S.I., Gel'd, P.V. and Matveyenko, I.I.

TITLE: Cubic vanadium carbide phases

PERIODICAL: Zhurnal strukturnoy khimii, v. 2, no. 4, 1961, 445 - 448

TEXT: The object of this investigation was to verify the results of work by earlier authors (Ref. 1: M.A. Gurevich, B.S. Ormont, Ah. neorgan. khimii, 2, 1566, 2581, 1957; 3, 403, 1958) and (Ref. 2: N. Schönberg, Acta Chem. Scand., 8, 624, 1954) and to obtain more precise information. Carbide specimens of various compositions were synthesized by sintering briquetted powder mixtures of vanadium hydride and spectroscopically pure graphite in a high frequency induction vacuum furnace at 1600 - 1750°. The vanadium hydride was prepared by reducing vanadium oxide with carbon or calcium. The powder was hydrated for 2

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D217/D306

Cubic vanadium...

hours at a hydrogen pressure of 1 atm., at 850°. The lattice parameter of the original metal was 3.020 kX, which indicated a low oxygen content (< 0.04 at.%); this was also confirmed by the high strength of the material. Sintering of the carbides was carried out for 40 - 70 hours with 2 - 3 intermediate re-briquetting operations. The compounds were cooled in the furnace for approximately 30 minutes. X-ray control was carried out after each operation. The attainment of equilibrium in the system was judged by the constancy of the lattice parameters and by the sharpness of the lines obtained in the X-ray pictures. The X-ray investigation was carried out in a Cr K_α irradiation in a Debye Camera of 143.3 mm diameter. The experimental error in the determination of lattice periods did not exceed 0.001 kX. The density of the compounds was measured in vacuum by the picnometric method, using kerosene and decalin as the liquid reagents. The errors in the density determinations were approximately 0.7%. The analysis of the carbides for vanadium content was carried out by a volumetric method, and the total and free

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Cubic vanadium... S/192/61/002/004/002/004 D217/D306

carbon were determined gravimetrically. The accuracy of the determination of x in the formula VC_x was approximately 0.02. The oxygen content of the specimens was less than the corresponding oxi-carbide $VC_x = O_{0.02}$. Altogether 17 specimens, containing between 10.93 and 25.73 weight % carbon ($VC_{0.52}$ - $VC_{1.47}$) were synthesized. The results of the X-ray investigation are shown. In the neighborhood of the compositions $VC_{0.79 - 0.80}$ a drastic change in the lattice parameter (approximately by 0.013 kX) occurs. From this it can be deduced that one cubic vanadium phase (δ) is stable in the range $VC_{0.63}$ - $VC_{0.79}$, and another (ε) is stable in the range $VC_{0.79}$ - $VC_{0.92}$. It was found that cubic vanadium carbides are characterized by defects in the carbon sub-lattice. It is also assumed that the high carbon phases as well as the vanadium sub-lattice are very slightly defective. There are 1 figure, 2 tables and 11 references: 5 Soviet-bloc and 6 non-Soviet-bloc. The reference to the English-language publication reads as follows: A.R. Ubbelohde, Proc. Roy. Soc., B826, 295 (1937).

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Cubic vanadium... S/192/61/002/004/002/004
D217/D306

ASSOCIATION: Institute khimii ural'skogo filiala AN SSSR, Sverdlovsk (Insitute of Chemistry of the Ural Branch, AS USSR, Sverdlovsk)

SUBMITTED: August 2, 1960

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"APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1

S/149/61/000/002/003/017
A006/A001

AUTHORS: Kusenko, F.G., Gel'd, P.V.

TITLE: On Equilibria in the Nb-C-O System

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Tsvetnaya metallurgiya, 1961, Vol 4, No. 2, pp. 43 - 52

TEXT: Among the methods of obtaining niobium metal, the carbothermic method is coming into extended use. Literature data on its thermodynamical substantiation (Ref. 1, 2) are only approximate and not based on reliable information as to the temperature of formation, heat capacities and standard entropies of a series of compounds of the Nb-C-O system. Only recently some authors (Ref. 3-12) have gathered new information on thermochemical characteristics of niobium oxides and carbides, permitting a more precise calculation for systems containing condensed phases of constant compostion. Equilibrium conditions in direct and indirect reduction of niobium pentoxide with carbon monoxide were studied. In indirect reduction reactions (1 - 4):

$$Nb_2O_5 + CO = 2NbO_2 + CO_2 \quad (1)$$

$$NbO_2 + CO = NbO + CO_2 \quad (2)$$

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$$NbO + CO = Nb + CO_2 \qquad (3)$$

$$Nb_xO_y + CO = Nb_xO_{y-1} + CO_2 \qquad (4)$$

are analyzed. Temperature relations for ΔZ^o_t and lgK_r are described by equations (I) $\Delta Z^o_r = A - BT$ and (II) $lgK_r = C - DT^{-1}$. In direct reduction the interactions of the gaseous phase not only with niobium oxides but also with carbon are considered: $C + CO_2 = 2CO$ (5). The indices of reactions of direct reduction are (6)-(8):

$$Nb_2O_5 + C = 2NbO_2 + CO \qquad (6)$$

$$NbO_2 + C = NbO + CO \qquad (7)$$

$$NbO + C = Nb + CO \qquad (8)$$

To describe process (5) the following polynomials (Ref. 11) are employed: $\Delta Z_t = 40800 - 41.7\ T$; $lgK_r = 9.114 - 8918\ T^{-1}$. Values of ΔZ_t and lgK_r thus calculated are shown in Figures 3 and 4. Since reduction of niobium pentoxide develops as a rule stepwise with intermediate formation of NbO_2 and NbO, it is sufficient to analyze reactions with the participation of NbC, Nb_2C, Nb, NbO, C and CO. Indices of interaction with the participation of higher oxides and carbides can be found from characteristics of reactions 6,7,8 and from the reactions below (9-18)

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On Equilibria in the Nb-C-O System

$$NbO + 1,5\,C = 0,5\,Nb_2C + CO \quad (9)$$
$$NbO + 2C = NbC + CO \quad (10)$$
$$NbO + Nb_2C = 3Nb + CO \quad (11)$$
$$NbO + NbC = 2Nb + CO \quad (12)$$
$$3NbC + NbO = 2Nb_2C + CO \quad (13)$$
$$NbC + 2NbO_2 = 3NbO + CO \quad (14)$$
$$2NbC + NbO_2 = NbO + CO + Nb_2C \quad (15)$$
$$NbC + Nb = Nb_2C \quad (16)$$
$$Nb + C = NbC \quad (17)$$
$$2Nb + C = Nb_2C \quad (18)$$

For these reactions the temperature dependences of ΔZ_t and lgK_T at 298 - 1800°K (Figure 3) can be described with sufficient accuracy (± 5%) by polynomials I and II and given coefficients. As a result of the studies performed the authors draw the following conclusions: Carbothermic reduction of Nb_2O_5 to NbO_2 can, from the

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A006/A001

On Equilibria in the Nb-C-O System

thermodynamical point of view, proceed at P = 1 atm and T > 1,230°K. The subsequent conversion of NbO_2 into NbO is possible at P = 1 atm and T > 1,650°K. The reduction of NbO to metal proceeds under less favorable conditions than processes entailing the formation of carbides. If the charge is calculated to obtain metal, then from the thermodynamical point of view, first higher carbide will be formed, which will gradually be oxidized to a lower carbide (or a solid solution) and metal. Indices of the last stage of the process are mainly determined by conditions of carbothermic reduction. This process at P = 1 atm is possible above 2,860°K. However, under conditions of a technical vacuum it can occur at t > 1,550°C. Considering the formation of solid solutions of oxygen and carbon in niobium (Ref. 18, 19) the necessity of higher temperatures and lower pressures is stressed. An analyzis of equilibrium conditions in such cases is beyond the limits of the present study. Results of the calculations described are in a satisfactory agreement with technological and kinetic observations.

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A006/A001

On Equilibria in the Nb-C-O System

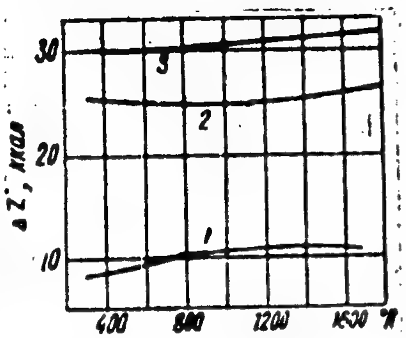

Figure 1:

The effect of temperature on changes of isothermal-isobaric potentials during the reduction of niobium oxides with carbon monoxide. The number of curves corresponds to the numbers of reactions.

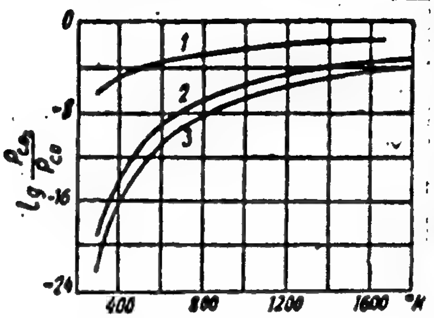

Figure 2:

Temperature dependences of equilibrium constants in reduction reactions of niobium oxides with carbon monoxide.

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S/149/61/000/002/003/017

On Equilibria in the Nb-C-O System

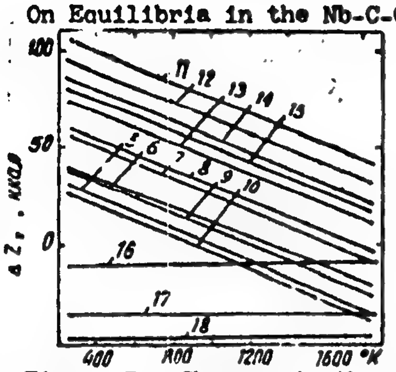

Figure 3: Changes in the isothermal-isobaric potentials of a series of processes in the Nb-C-O system

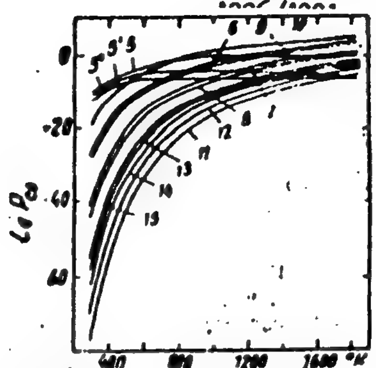

Figure 4: Temperature dependence of equilibrium constants in the Nb-C-O system

There are 3 tables, 4 figures and 19 references: 9 Soviet, 8 English and 1 German.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute)

SUBMITTED: April 12, 1960

Card 6/6

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15.2640
24.7700

24482
S/126/61/011/006/008/011
E193/E483

AUTHORS: Korshunov, V.A. and Gel'd, P.V.

TITLE: On the electrical properties of the higher manganese silicide

PERIODICAL: Fizika metallov i metallovedeniye, 1961, Vol.11, No.6, pp.945-947

TEXT: Interest in the silicides of the transition metals has been aroused in connection with the search for corrosion-resistant semiconducting materials, characterized by high electrical conductivity and thermo-e.m.f. combined with low heat conductivity. The results of earlier investigations (Ref.2: Ural Polytechnical Institute, 105, Sverdlovsk, 1960, p.142; Ref.3: Izv. vyzov, Fizika, 1960, No.6, 42) showed that alloys of the Mn-Si system, particularly those containing 45 to 50% Si, possess some useful electrical properties whose concentration-dependence could not be explained in terms of the known data on the constitution of alloys of this system. Metallographic, X-ray and thermal analysis of Mn-Si alloys with 44 to 50% Si, carried out by the present authors (Ref.6: Korshunov, V.A., Sidorenko, F.A., Gel'd, P.V. and Davydov, K.N., FMM) showed that, contrary to the published data

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E193/E483

On the electrical properties ...

(Ref.4: Hansen M., Anderko, K., Constitution of Binary Alloys, N.Y.-L.-T., 1958; Ref.5: Pearson, W.B., A Handbook of Lattice Spacings and Structures of Metals and Alloys, L.-N.Y.-P.-L.-A., 1958) an intermediate phase (different from $MnSi_2$) is formed in the MnSi-Si system. The phase has a rather narrow range of stability (46 to 77% Si) and although it could be regarded as a solid solution of Si in Mn_3Si_5, it more likely constitutes a distorted structure based on $MnSi_2$. The object of the present investigation was to study the concentration-dependence of the electrical properties of commercial grade Mn-Si alloys, based on the higher manganese silicide. The method of preparation of cylindrical specimens (4 mm in diameter) containing 44 to 51.5% Si and the experimental technique were those used in the earlier work (Ref.2). The results of measurements carried out at 20°C are reproduced in Fig.1 where the electrical conductivity (σ, ohm^{-1} cm^{-1}, left-hand scale, lower curve) and the thermo-e.m.f. against platinum (α, $\mu V/°C$, right-hand scale, upper curve) are plotted against the Si content (in wt.%). The temperature-dependence of the properties studied is illustrated in Fig.2 where σ, α and $\alpha^2\sigma$ are plotted against temperature (°C),
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subscripts "1" and "2" denoting properties of specimens containing 47 and 47.5% Si respectively. The carrier concentration in the 300 to 700°K temperature interval was constant at approximately $9 \times 10^{19} cm^{-3}$. The hole mobility at room temperature was $v_p = 40\ cm^2/sec$ and varied with temperature according to $v_p \sim T^{-0.84}$. It was inferred from these results that the higher manganese silicide can be regarded as degenerate semiconductor, characterized by p-type conductivity, and that covalent bond predominates in the alloys studied. It was concluded that the Si-rich, bi-silicide-based Mn-Si alloys possess an almost optimum carrier concentration and are characterized by temperature-dependence of α and $\alpha^2\sigma$ which render them suitable as materials for thermo-electric generators. Taking into account the fact that the lattice component of heat conductivity $\varkappa$ should predominate in these alloys and that $\varkappa$ is inversely proportional to temperature, the efficiency coefficient $z = \alpha^2\sigma/\varkappa$ of such thermo-elements will increase with rising temperature. Using the values of $\varkappa$ obtained by B.B.Dubrovina, the present authors calculated that for the alloy with 47% Si, $\bar{z} \approx 0.42 \times 10^{-3}/°C$ and the

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On the electrical properties ...

efficiency $\approx$ 6.0 to 6.5%, similar results (5 to 5.5%) having been obtained for the alloy with 47.5% Si. There are 2 figures and 10 references: 7 Soviet-bloc and 3 non-Soviet-bloc. The three references to English language publications read as follows:

Hansen M., Anderko K., Constitution of Binary Alloys, N.Y.-L.-T.1958;
Pearson W.B., A Handbook of Lattice Spacings and Structures of Metals and Alloys, L.-N.Y.-P.-L.-A., 1958;
Mooser E., Pearson W.B., J.Electronics, 1956, 1, 629.

ASSOCIATION: Ural'skiy politekhnicheskiy institut im. S.M.Kirova (Ural Polytechnical Institute imeni S.M.Kirov)

SUBMITTED: December 10, 1960

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R000514620002-1"